

Career Academy Integrated Unit Plan

Academy Name: STEM
Date Created: 6/16/2011

School: University HS
Created by: Steve Perri

Integrated Unit Plan Title: Paper Bridge
Courses to integrate: Engineering and Science
Grade Level: 9, 10, 11, 12
Timeline & Duration: 2 weeks

Unit Summary: This unit will cover Newton's three laws of motion. It will be the student's job to describe if there is any relation to the laws and the system (bridge).

Overview of Activities/Lessons per Course				
Course	Principals of Engineering	Physics		
Activity/Lesson	Paper Bridge	Application of Newton's Three Laws of Motion		
Activity/Lesson				

Lesson Instructions for Paper Bridge (course): Principals of Engineering

Standards (Performance Tasks or Course Frameworks or Sunshine State Standards): SC.912.P.12.3 Interpret and apply Newton's three laws of motion.

Rigor & Relevance (quadrant): D - Adaptation

<p>Instructions to Teacher: As a result of this learning activity, your students will be able to do the following:</p> <ul style="list-style-type: none"> ✓ Explain what a <i>truss</i> is. ✓ Identify the major components of a truss bridge. ✓ Identify the types of truss bridges. ✓ Explain the following fundamental structural engineering concepts: <i>force, load, reaction, equilibrium, tension, compression, and strength</i>. ✓ Explain how a truss bridge works—how each individual component contributes to the ability of the entire structure to carry a load. ✓ Explain the roles of the four key players in the design-construction process—the <i>Owner</i>, the <i>Design Professional</i>, the <i>Constructor</i>, and the <i>Project Manager</i>. ✓ Explain how construction quality affects the performance of a structure. <p>The Paper Bridge is a group project for the purpose of teaching forces, loads and reactions; the bridge is to be built in stages. Students will be given a complete booklet of self explanatory instructions to follow.</p>
<p>Instructions to Students: In this learning activity, you will build a model truss bridge that has already been designed for you. When construction is complete, you will load the bridge to determine if it performs as its designer intended. With the load in place, you will be able to observe how the structure works—how the various structural members work together to carry the load safely and efficiently. You will Learn many key concepts about trusses and structural behavior. You will learn about the challenges faced by real-world construction contractors, who are often required to build structures that have been designed by someone else; and at the end of the project, you will save the model as evidence of your bridge-building skill.</p>
<p>Instructions for Student Accommodations: Extra time will be given if needed.</p>
<p>Assessment for Activity: The bridge will be tested by hanging 11.2 lbs from the center span</p>
<p>Approximate Length of Time for Activity: 2 weeks, 3 weeks if accommodations are given</p>
<p>Materials Needed: 3 paper file folders, glue, scissors, transparent tape</p>
<p>Resources Needed: Printer, paper</p>
<p>Attachments: West Point Bridge Design Contest http://bridgecontest.usma.edu/manual.htm “Build a Model of a Truss Bridge”</p>

